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DRAWINGS ATTACHED

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COMPLETE SPECIFICATION

Paper/Plastics Foil for the Surface Improvement of Board Materials

I, KLAUS HEINRICH SCHEUFELEN, trading as Papierfabrik Scheufelen, Oberlenningen, Germany, a German citizen, do hereby declare the invention, for which I pray that a patent may be granted to me, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The invention relates to a paper-plastics foil for the surface improvement of board materials and a method of producing such foil.

It has already been proposed to provide boards such as those made from shavings, fibre or plywood with a superior surface by the application of a decorative facing material. Sheets made from shavings, for example, are at present improved in the following manner:

1. A laminate with a decorative facing is applied to the chipboard with the aid of a polyvinyl alcohol adhesive.
2. A decorative paper impregnated with melamine formaldehyde resin is applied to the chipboard by hot pressing.

The finish described under 1 above first requires the separate production of a laminate, which can be done by pressing together layers of resin-impregnated paper at about 140°C. to 150°C. and approximately 150 kp./sq.cm. The layers to be pressed together may be assembled as follows: Reverse tension paper (unprinted decorative paper) impregnated with melamine resin; several kraft papers (core papers) impregnated with phenol formaldehyde resin; underlay (or barrier) paper, mostly white, impregnated with melamine resin; printed or unprinted decorative paper impregnated with melamine resin; and overlay paper impregnated with melamine resin. The resulting laminate may be applied to one side or both sides of the chipboard.

The finish described above under 2 is obtained by applying to one side or both sides of a sheet of chipboard, at about 145°C. and under a pressure of about 10 to 25 kp./sq.cm. (preferably 15 to 20 kp./sq.cm.), a single-coloured or printed decorative paper, highly absorbent and opaque, impregnated with melamine formaldehyde resin.

The board materials treated by existing methods are rather expensive, because the decorative paper made in a paper-making machine has to be separately impregnated with resin—about 100%—130% by weight (referred to the weight of paper)—in an impregnating machine, the output of which is usually only about 6 m. to 12 m. of the run of paper per minute. Moreover, the papers thus impregnated and the pressed sheets are brittle and fragile, giving rise to a high proportion of rejects during manufacture and subsequent use. Furthermore, with chipboard treated by the second method, stress cracks readily appear on the faced sides under the action of heat or in a dry atmosphere, this being attributable to the different behaviour or "working" of the chipboard and the resin-impregnated decorative layer.

The present invention seeks to provide a paper-plastics foil for the surface improvement of board materials and a method of

[*Price 5s. 0d. (25p)*]

making such foil in which some or all of the disadvantages of the above described surface finishes are obviated or substantially reduced.

According to the invention there is provided a paper/plastics foil for the surface improvement of board materials, comprising paper processed from a pulp filled with a dispersion of a synthetic thermoplastic material, the paper being provided with a film of a plastics material on at least one face.

Preferably the paper is impregnated with a thermosetting synthetic resin and may be bonded to the surface of chipboard, fibreboard or plywood.

A method of making this foil comprises the addition to an ordinary pulp containing cellulose fibres, suitable for paper making, of a dispersed thermoplastic polymer to the extent of 20% to 40% by weight (referred to weight of fibre), this material being processed to produce a sheet filled with the plastics material and the application of a film of a plastics material to at least one side of the almost dry sheet.

Preferably the sheet is impregnated with a thermosetting synthetic resin before the film of the plastics material is applied and the finished paper/plastics foil may be printed on at least one side. The film of the plastics material may consist of a heat-sealing plastics material.

It has been found that the surfacing of chipboards with the foil made in the paper machine, in accordance with the invention, is remarkably simple and—since the foil is not brittle or fragile—can be carried out almost without rejects. It has also been found that a chipboard improved as here proposed is free from the formation of cracks due to heat or to drying out.

The above and other aspects of the invention will now be described by way of example with reference to the accompanying drawing, the simple figure of which is a perspective view of a portion of board surfaced with a foil in accordance with the invention, and a number of examples.

A paper-plastics foil suitable for surfacing board materials such as chipboard, fibreboard or plywood can be produced in accordance with the invention as follows:—

Short and/or long cellulose fibres are milled in the conventional manner in the usual mixing ratio, with white and/or tinted pigments, which provide the requisite opacity and colour. Before or after milling, a wet stabilising agent is added. After milling, 20%—40% by weight (preferably 25%—35% by weight)—referred to the amount of fibre material used—of a finely dispersed thermoplastic polymer plastics is added, followed finally by the addition of the pigment retention agents. The pH value of the pulp is thereupon adjusted to the desired value, e.g. 6.8, and automatically regulated by means of aluminium triformiate, aluminium sulphate or acid solution.

The material having passed the pulp charger, wire, wet presses and drying cylinders of a standard paper-making machine, a film of preferably hot-sealing plastics is applied to one side or both sides of the almost dry web of paper, either while still in the paper-making machine or in a separate coating machine, by means of ordinary coating or facing equipment, the film being applied either by the use of a dispersion of plastics or in the form of liquid plastics, an extruder or some other suitable means being used.

The foil thus produced can now be printed, the impression being made either on the film-coated side or on the film-free side of the paper. The printing quality will be found extremely good, because of the elasticity of the plastics dispersion with which the paper is filled.

The foil conforming to the invention, whether printed or not, can be used in various ways in connection with the production of fine-finished decorative boards.

1. The paper/plastics foil can be improved on the side bearing the plastics film, with a plastics foil—transparent, for example—and in particular with a film of polyvinyl chloride, by, for instance lamination under heat in a calender. The resulting material can be applied by its paper-like rear side, with the aid of an adhesive, to chipboard, for example. Before the plastics foil is applied, the paper/plastics foil may be printed on the film side.
2. The paper/plastics foil may be left unprinted or be printed on the paper-like film-free side and then applied to chipboard, for example, with the aid of the hot-sealing film side. This is the case illustrated diagrammatically in the drawing. The reference numeral 1 indicates the paper/plastics foil, coated with a plastics film 2, and printed with a woodgrain finish on the paper-like rear side, 3, the interior being filled with plastics, 4, and secured by means of the hot-sealing film side to chipboard 5. The chipboard faced in this way can be used as such, but it may also be further improved by treating with polyester or cellulose lacquer or some other clear or tinted lacquer normally used in the furniture trade. One marked advantage is that the opacity of a foil treated in this way is better than that of a decorative paper impregnated with approx. 100% melamine resin and pressed.
3. The paper/plastics foil, unprinted or printed on the paper-like rear side, can be applied under pressure by the hot-sealing film side to chipboard or hard-

board or to a layer of absorbent core papers (soda kraft papers) impregnated with phenol formaldehyde resin. In addition, to provide a mechanically highly resistant surface, an overlay paper (an unpigmented lightweight paper that becomes transparent after resin impregnation and pressing) is pressed at the same time on to the top face of the paper/plastics foil. Pressing is carried out in the usual conditions known to the experts in the production of decorated laminated boards.

EXAMPLE I

A cellulose suspension with white and coloured pigments added, such as is usual in thep roduction of decorative paper, is milled in the normal way with pulp engines or refiners, a wet stabilising agent—"Nadavin" (Registered Trade Mark), for example, made by Farbewerke Bayer Leverkusen—being added. The resulting aqueous dispersion then has added to it 20%—40% (preferably 25% —35%) of an aqueous dispersion of some thermoplastic polymer plastics, such as "Lutofan" (Registered Trade Mark) (a co-polymer of polyvinyl chloride), the percentages representing the solid content of the plastics dispersion, referred to 100 parts of cellulose in the absolutely dry state. After milling, retention agents are added—for example, polyacrylic amide (Retaminol), galactomannan (Polygal), sodium aluminate—and the desired pH value is adjusted to the value 6.8, for instance, with aluminium sulphate, aluminium triformiate or an acid. The pulp suspension is then fed in the usual way through the pulp charger on to the wire of a paper-making machine and the paper web formed on the wire is passed through the wet presses and drying cylinders in the paper machine. Next, a film of plastics is applied to the top and/or underside of the web, which can be done by the application of an aqueous dispersion of a plastics material or of a solution of plastics by means of conventional equipment (e.g. glue press, air brush, application roller or doctor knife). The film of plastics is applied either during the run of the paper on the paper-making machine or with a separate coating machine after completion of the paper.

EXAMPLE II

A paper/plastics foil is made as in Example I, the plastics dispersion used for filling the paper being a dispersion of a styrol/butadiene co-polymer and use being made similarly of a styrol/butadiene co-polymer dispersion for the film applied to one side.

EXAMPLE III

The procedure is the same as in Example I, but the plastics dispersion used in a co-polymer of acrylic butyl ester and vinyl acetate.

EXAMPLE IV

The procedure is the same as in Example I, but the plastics dispersion used is a co-polymer of methacrylic butyl ester and methacrylic ethyl ester.

EXAMPLE V

The procedure is the same as in Example I, but the plastics dispersion used is a vinyl propionate polymer.

EXAMPLE VI

The procedure is the same as in Example I, but the plastics dispersion used is a co-polymer of vinyl acetate and vinyl palmitate.

EXAMPLE VII

The procedure is the same as in Example I, but the wet stabilising agent used in place of Nadavin is melamine formaldehyde resin, which is not added until after milling.

EXAMPLE VIII

A paper/plastics foil made in accordance with any one of the examples I to VII, one side of which has the character of paper and the other that of a plastics, is printed on the film side and provided on this side, in the usual manner, with a transparent colourless or tinted plastics foil, such as polyvinyl chloride foil, for example, which can be applied, for instance, by calendering.

The material thus obtained can be rolled up and, in accordance with a further feature of the invention, can be applied by its paper side, by the use of an adhesive, to chipboard or fibreboard or a sheet of metal or wood, thereby providing decorative, cheap boards for use in furniture making, for example.

EXAMPLE IX

A paper-plastics foil made in accordance with any one of the examples I to VII is printed with timber graining on the paper side, in accordance with the invention, and applied by its hot-sealing film side, under pressure and heat, to chipboard, fibreboard or a board of wood.

Decorative boards can be obtained in this way, the surface of which, though certainly not particularly scratchproof, can be further improved by treating with a standard synthetic resin lacquer, such as furniture or marine varnish of cellulose lacquer, to resemble veneered boards. For the furniture trade, this has the advantage that the tone of the board surface can be regulated by the choice of a suitable coloured varnish or lacquer, for example.

EXAMPLE X

In another form of the invention a paper/

plastics foil made in accordance with any one of the examples I to VII is printed on the paper side, the printed paper side is faced with an overlay paper impregnated with melamine formaldehyde resin and then the hot-sealing film side is pressed on to chipboard, fibreboard or a wooden board at a pressure of approx. 20 kp./sq.cm. and at 150°C., to produce improved boards having glossy or matt scratch-proof surfaces, according to whether the chromium-plated metal pressure plates are highly polished or dull.

EXAMPLE XI

A paper/plastics foil made in accordance with any one of the examples I to VII is printed on the paper side, covered on the printed paper side with an overlay paper impregnated with melamine formaldehyde resin and then pressed by its hot-sealing film side, at a pressure of about 100 kp./sq.cm. and at 150°C., on to one side of a layer of core papers (soda kraft papers) impregnated with phenol formaldehyde resin, on the other side of which may be a decorative paper (reverse tension paper) impregnated with melamine formaldehyde resin. The pressing is carried out between chromium-plated plates or between separating papers. This produces scratch-proof glossy or matt decorative boards.

EXAMPLE XII

The procedure followed in any one of the examples I to XI is repeated, but the run of paper, before the plastics film is applied, is impregnated with a thermosetting synthetic resin such as, for example, melamine, phenol and/or urea formaldehyde resin. This produces a paper/plastics foil of enhanced hardness, firmness and surface quality.

The paper/plastics foils considered here and the laminated boards made from them in accordance with the invention have the following advantages:—

The paper/plastics foils receive their content of plastics material in advance, on the fast-running paper-making machine, and thus need no longer be impregnated with resin in separate, very slow machines. The foils can be stored for a very long, practically unlimited period, whereas the usual decorative papers impregnated with melamine formaldehyde resin can be stored only for a strictly limited period, because of the progressive polycondensation of the resin. In addition the foils conforming to the invention can readily be rolled up and printed and are easy to use. The usual decorative papers impregnated with melamine formaldehyde resin, on the contrary, are brittle and break easily.

For the purpose of producing finely finished boards, the paper/plastics foils here proposed can be made with such plastics as prevent the undesirable "bleeding through" of the phenol formaldehyde resin. The plastics introduced in accordance with the invention form, in fact, a barrier to phenolic resin. This means, too, that a separate barrier paper can be saved. Moreover, when foils conforming to the invention are used, a smaller amount of plastics is required than, for example, with decorative papers impregnated with melamine formaldehyde resin. Thus, with laminated boards produced in accordance with the invention, the opacity is also better than when decorative papers impregnated with melamine formaldehyde resin are employed. Finally, as already mentioned, decorative boards and improved boards such as chipboard, for example, can be produced more cheaply with the aid of paper/plastics foils conforming to the invention than by the methods used hitherto.

WHAT I CLAIM IS:—

1. A paper/plastics foil for the surface improvement of board materials, comprising paper processed from a pulp filled with a dispersion of a synthetic thermoplastics material, the paper being provided with a film of a plastics material on at least one face.

2. A foil as claimed in claim 1, wherein the paper is impregnated with a thermosetting synthetic resin.

3. A foil as claimed in claim 1 or 2, wherein the foil is bonded to the surface of chipboard, fibreboard or plywood.

4. A method of making a foil as claimed in claim 1, comprising the addition to an ordinary pulp containing cellulose fibres, suitable for paper making, of a dispersed thermoplastic polymer, to the extent of 20% to 40% weight (referred to the weight of fibres), this material being processed to produce a sheet filled with the plastics material and the application of a film of a plastics material to at least one side of the almost dry sheet.

5. A method as claimed in claim 4, wherein the sheet is impregnated with a thermosetting synthetic resin before the film of the plastics material is applied.

6. A method as claimed in claim 4 or 5, wherein the finished paper/plastics foil is printed on at least one side.

7. A method as claimed in any of claims 4, 5 or 6, wherein the film of the plastics material consists of a heat-sealing plastics material.

8. A paper/plastics foil for the surface improvement of board materials constructed and arranged substantially as described herein and as shown in the accompanying drawing.

9. A method of making a foil as claimed in claim 1, the method being substantially as described herein with reference to the accompanying drawing.

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